Project Manager's Quarterly Progress Report – 3rd Quarter FY 2003
U.S. Large Hadron Collider Construction Project

1. PROJECT IDENTIFIERS

Reporting Period:	Through June 30, 2003
Program Sponsors:	DOE High Energy Physics Division/NSF Physics Division
DOE/NSF Program Manager:	Moishe Pripstein, (301) 903-4115, moishe.pripstein@scince.doe.gov
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2. PROJECT DESCRIPTION

The Department of Energy (DOE) and the National Science Foundation (NSF) have signed agreements committing to collaboration in the construction of the Large Hadron Collider (LHC) at CERN (European Laboratory for Particle Physics) and two of its associated detectors. The U.S. fabrication effort will be carried out at, or under the supervision of, U.S. universities and national laboratories under the terms and conditions described in the International Collaboration Agreement (Agreement) and its Accelerator and Experiments Protocols. The U.S. LHC Construction Project is defined by the goods and services to be provided to CERN under the terms of the Agreement between DOE, NSF, and CERN. These goods and services include DOE contributions to the LHC accelerator, and DOE and NSF contributions to the ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid) experiments.

The DOE contribution to the LHC accelerator consists of items provided by DOE National Laboratories and CERN direct purchases from U.S. industrial firms. The scope of these contributions is addressed in the Accelerator Protocol and described in detail in an Implementing Arrangement between the collaborating DOE National Laboratories and CERN. The DOE and NSF contributions to the ATLAS and CMS detectors consist of items supplied by the collaborating U.S. universities and DOE National Laboratories. The scope of these contributions is addressed in the Experiments Protocol and described in detail in Memoranda of Understanding for collaboration on construction of each experiment.

The U.S. LHC Construction Project includes the U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator Construction projects. This report summarizes the overall status of the U.S. LHC Construction Project effort and includes more detailed status information on each sub-project. Additional information can be accessed at the following web sites:

U.S. LHC Project - http://www.hep.net/doe-hep/lhc.html
LHC Project - http://wwwlhc.cern.ch/ U.S. LHC Accelerator - http://www-td.fnal.gov/LHC/USLHC.html
ATLAS - http://atlasinfo.cern.ch/Atlas/Welcome.html U.S. ATLAS - http://www.usatlas.bnl.gov/
CMS - http://cmsinfo.cern.ch/Welcome.html U.S. CMS - http://uscms.fnal.gov/

3. PROJECT MANAGER'S NARRATIVE HIGHLIGHTS

The current list of DOE/NSF project reviews and status meetings is provided below:

U.S. LHC Construction Project	Event	Date
U.S. LHC Program/Project	Joint Oversight Group Meeting	September 23, 2003
U.S. LHC Accelerator Project	DOE Review	October 15-16, 2003
U.S. CMS Detector Project	DOE/NSF Status Meeting	November 20, 2003
U.S. ATLAS Detector Project	DOE/NSF Status Meeting	November, 2003

The results of these activities are documented in formal reports and meeting notes. The U.S. CMS and ATLAS projects submit monthly reports and the U.S. LHC Accelerator project submits a quarterly report. Current performance data is summarized in the following tables:

Table 3.1, Schedule Performance Indices

	Planned Complete (BCWS/BAC)	Actual Complete (BCWP/BAC)	Schedule Performance (BCWP/BCWS)
U.S. ATLAS	75%	75%	100%
U.S. CMS	85%	79%	92%
U.S. LHC Accelerator	90%	85%	94%

Table 3.2, Contingency Status (in thousands of dollars)

	Total Project Cost (TPC)	Budget at Completion (BAC)	Contingency	Budgeted Cost of Work Performed (BCWP)	Remaining Work to be Performed (BAC-BCWP)	Contingency/ (BAC-BCWP)
US ATLAS	163,750	145,837	17,913	109,128	36,709	49%
US CMS	167,250	149,463	17,787	117,428	32,035	56%
US Accelerator	110,000	106,237	3,763	90,597	15,640	24%

Table 3.3, Cost & Schedule Performance (in thousands of dollars) Indices

	Cumulative Costs to Date					Costs at Completion		
	Budgeted Cost			Variance			Revised	
	Work Scheduled	Work Performed	Actual Cost	Schedule	Cost	Budgeted	Estimate	Variance
U.S. ATLAS	109,594	109,128	108,129	-466	999	163,750	163,750	0
U.S. CMS	127,630	117,428	108,131	-10,202	9,297	167,250	167,250	0
U.S. LHC Accelerator	96,135	90,597	94,235	-5,538	-3,638	110,000	110,000	0
CERN Invoices	48,619	48,619	48,619	0	0	90,000	90,000	0
U.S. LHC Total	381,978	365,772	359,114	-16,206	6,658	531,000	531,000	0

4. PROJECT MANAGER'S ASSESSMENT

The U.S. projects continue to meet their goals and are reliable and influential partners in the construction of the ATLAS and CMS detectors and the LHC machine.

Cost – Cost performance is good. The cumulative Cost Performance Index (CPI) for the total U.S. LHC Construction Project (U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator) is 1.02, which is slightly favorable overall. The current Estimate At Completion for the U.S. LHC Accelerator project indicates that contingency remains marginal and continues to be monitored closely. The Accelerator project is working with local management at each lab to decrease this EAC, and increase contingency, and to ensure commitments at each lab to manage the project completion to agreed cost.

U.S. CMS contingency remains at ~50% of remaining costs and is considered sufficient to bring the present scope in successfully. Given favorable financial performance, recent contingency usage has enabled adding scope in the Endcap Muon system. Additional scope items are anticipated within the Electromagnetic Calorimeter baseline (under revision to adopt an alternative electronics design needed to resolve a technical issue). As a result of very good recent performance and progress, and through close coordination with ATLAS, U.S. ATLAS has applied available contingency toward items essential for a working detector. Future contingency usage is anticipated for LAr calorimeter power supply production, installation activities, or further contributions to common ATLAS needs (e.g. technical coordination and other areas). Contingency is currently ~50% of the costs to go and should be adequate to complete the baseline scope.

Schedule – Schedule performance is measured by milestone completion and by earned value. The total U.S. LHC Construction Project schedule overall is slightly behind plans with a cumulative Schedule Performance Index (SPI) of 0.95, unchanged from the previous Quarter and indicating no major slippages in schedule. The total U.S. LHC Construction Project is seventy-nine percent complete based on earned value. The CERN schedule calls for first beams in April 2007. A period of beam commissioning will be followed by start of the LHC Physics Program in the latter half of 2007.

U.S. LHC Accelerator Project milestones for deliverables have been updated based on current U.S. production schedules and the LHC installation schedule, with float between expected U.S. delivery dates and CERN installation requirements. U.S. CMS fully anticipates delivering its commitments to CMS on or before the relevant milestone dates in the current approved schedule for the construction and installation phases of CMS. U.S. CMS plans to begin pre-commissioning its deliverables on the surface prior to the final installation phase in the underground experimental hall. U.S. ATLAS has updated the baseline schedule and float for each subsystem to reflect ATLAS required delivery dates. Installation in the ATLAS underground cavern has started as the first elements have been installed (shielding interface between the LHC machine and ATLAS detector). The current detector schedules support an LHC pilot run in April 2007 with first physics scheduled for August 2007.

Technical - Good technical progress continues across the project, and we remain confident that the U.S. deliverables to CERN can be realized with the planned funding. The U.S. LHC Construction Project deliverables are accepted by CERN and approved by the DOE/NSF Joint Oversight Group. We expect to provide additional items to CERN, within the approved funding, should cost performance be favorable. Important achievements or milestones continue to be met. All four U.S. produced TAS beam absorbers for the LHC interaction regions left LBNL for shipment to CERN. Mounting of the large U.S. CMS/Fermilab produced muon Cathode Strip Chambers is well underway at CERN. U.S. ATLAS/ANL engineers worked with CERN to successfully complete pre-assembly of an entire Tile Calorimeter extended barrel. Additional technical Project highlights are given in the report.

ISSUES

LHC Construction Completion—The CERN Council and CERN management have actively worked to solve the LHC fiscal difficulties and management challenges by revising CERN's programs, priorities and structure and seeking additional resources where possible. The emphasis is on maintaining technical progress on major machine components and civil construction and meeting the schedule to start commissioning in April '07 which is considered possible, but challenging. This schedule was confirmed by CERN at the June, 2003 meeting of the CERN Coucil. CERN should know whether this schedule can be met with greater confidence by the end of 2003 and when full production rates are reached for the dipoles. The LHC Superconducting Cable and Magnet Production Review of June 23-26, 2003, on which the U.S. serves, reports that diligent procurement management on the part of the CERN team and their vendors is required to meet delivery requirements.

ATLAS and CMS Resources– Both collaborations have presented updated financial plans to the detector Resource Review Boards (RRBs) in April, 2003. The updated plans address funding shortfalls previously identified, and the collaborations have had some success identifying funds and actions to significantly reduce those shortfalls. Additionally, costs of sub-detectors have been updated to cover the shortfalls through reducing redundancy, using existing contingencies, or further detector staging. In cases of detector staging, acceptability of physics impact is considered for initial physics running. The funding profiles present cash flow problems in some areas, which the collaborations are working with the funding agencies and RRBs to solve or minimize. There may be potential impact on overall detector installation schedules if the cash-flow situation cannot be successfully managed. The collaborations continue the process of firming up commitments internationally from those funding agencies that can provide additional resources (U.S. LHC construction funds are capped), a process likely to continue over the final years to completion. If successful, this process could allow the collaborations to gradually improve the expected performance and capability of the initial detectors to more fully exploit physics opportunities.

5. NARRATIVE SUMMARY

5.1 U.S. ATLAS CONSTRUCTION PROJECT

ATLAS International.- The LHC Committee (LHCC) had a comprehensive review in June 2003 to assess the critical ATLAS construction issues. Schedule concerns remain in some areas of the electromagnetic calorimeter, barrel toroid and inner detector subsystems and a revised schedule and milestones have been approved. There are no major changes in the overall financial outlook for ATLAS, and detector planning, construction and integration continues in accordance with the completion strategy agreed to with the Resource Review Board.

- Integration of the two large Endcap toroids and components for the eight Barrel toroid coils is progressing well; this phase 1 integration has included assembly of supports, superinsulation, thermal shields, and physically erecting these huge vertical structures on the surface.
- Central solenoid cryogenics with superconducting bus lines have been tested, cooled down to 4.5K with a current of 9000 Amps (20% over the nominal operational current).
- The ATLAS cavern was handed over to the collaboration by the CERN Director General, in the presence of the Swiss President- a major milestone.

U.S. ATLAS- As of June 30, 2003 the project is 79% complete out of 79% planned, reflecting the most recent update of cost and schedule estimates (Estimate-To-Complete '03) for the remaining work to complete the baseline scope. A DOE/NSF review of the construction project was conducted on May 21-23, 2003 at BNL. There are no major technical issues- all U.S. ATLAS subsystems are now in production and detector components are being successfully delivered to CERN. Cost and Schedule performance is very good. Contingency planning, prioritization and allocation strategies are focused on ensuring that adequate contingency levels can be maintained through project completion. The current U.S. ATLAS schedule meets ATLAS needs. Forecast dates above have been revised to reflect the latest schedule estimates. Below are a few highlights of the U.S. ATLAS construction project:

- Silicon: Pixel mechanics progresses well with disk sector production at a good pace. 61% of the Pixel sensors have been received, with nearly all characterized, and of good quality.
- Transition Radiation Tracker (TRT): All sites are nearing completion of the total of 102 modules. Three modules have been scanned and two of them have been shipped to CERN.
- Liquid Argon Electromagnetic (EM) Calorimeter: The 2nd wheel of the barrel EM calorimeter is completed and rotated into vertical position. Front End Board electronics production is delayed pending a fully functional voltage regulator (expected in November).
- Tile Hadron Calorimeter: ANL engineers at CERN continue helping with successful pre-assembly of an Extended Barrel Tile calorimeter.
- Muon: All 16 CSC1 base chambers were completed and MDT base chamber production is on schedule; CERN test-beam effort continues, with fully integrated U.S. chambers.
- Trigger/DAQ: The Technical Design Report (TDR) was completed in June. Preparations for baselining and assigning U.S. responsibilities is planned for September 2003.

5.2 U.S. CMS CONSTRUCTION PROJECT-

CMS International- The LHC Committee (LHCC) met in July 2003 to monitor the critical CMS construction issues. The Electromagnetic calorimeter construction schedule, and magnet coil and Silicon Tracker production are critical path concerns, and continue to receive on-going and close attention. Critical path for the magnet has shifted from coil production to mandrel production, and the aim is to keep other delays (e.g. Silicon Tracker) within this shadow. There are no major changes in the overall financial outlook for CMS, as the collaboration maintains its planning efforts to bring in a working detector on schedule with all available funds directed toward reducing the existing shortfall.

- Excavation of the UXC55 and USC55 caverns is complete, and the concreting is advancing well; preparations are underway to repair the access shafts following a water ingress, and to mitigate any potential delays.
- 17 out of 21 solenoid magnet conductor cables are complete and the first of 5 coil modules has been wound; after completion of 2 coil modules, critical path schedule will be assessed.
- A new ECAL front-end electronics chip design was selected for this critical path item, showing promise as a cheaper, better performing option.

U.S. CMS- As of June 30, 2003, the overall U.S. CMS Construction Project was 79% complete vs. the scheduled 85% complete. A DOE/NSF review of the U.S. CMS construction project was conducted at Brookhaven on May 19-21, 2003. Technical progress is excellent, and the U.S. CMS construction project is on budget. There are no major schedule slippages, but delays exist in production of some subsystem electronics and components, particularly the electromagnetic calorimeter (ECAL) electronics (on the CMS critical path) and the Silicon Tracker. An important decision has been made to accept an alternate ECAL electronics design, which should yield significant progress. Silicon Tracker module production continues, paced by slow arrival from CERN of a key component and this situation continues to be monitored. Below are a few highlights of the U.S. CMS construction project:

- Endcap Muon (EMU): Cathode Strip Chamber (CSC) production at Fermilab is now complete, and also near cost and schedule. CSC testing at the US FAST sites (UCLA and U-Florida, managed by UC-Riverside) is progressing well, with over 70 of 148 CSC's already delivered to CERN. 36 of the large U.S. chambers have already been mounted, with another 36 scheduled in September 2003.
- Hadron Calorimeter (HCAL): both HCAL half barrels (HB-1 and HB+1) have been delivered to CERN, and have been reassembled at SX-5 and fitted with optical megatiles. Fermilab is now producing production optical decoder units (ODUs) for the HCAL readout boxes; Major test beam activities are underway at CERN, with electronics procurement scheduled for late CY2003 after the test beam run with pre-production prototypes.
- Calorimeter trigger is on schedule; DAQ effort is on schedule/budget and work on Technical Design Report is complete. DAQ will be built "as-late-as-possible" to take advantage of technological advances and so completion is a part of CD4-B.

5.3 U.S LHC ACCELERATOR CONSTRUCTION PROJECT

LHC Accelerator- In June, 2003 the CERN Council confirmed the LHC completion schedule, to deliver first beam in April 2007. Also in June 2003 an "LHC Superconducting Cable and Magnet Production Review" was conducted. The committee found that the CERN team and their vendors were able to provide dipole and quadrupole coils and cold masses and materials that exceeded the aggressive CERN specifications for quality and performance. The committee re-iterated that the next six months are critical, as all manufacturers must attain peak series production rates to meet LHC requirements. Additional LHC Project highlights follow:

- LHC accelerator production progress can be tracked on the "LHC Dashboard" at, http://lhc-new-homepage.web.cern.ch/lhc-new-homepage/DashBoard/index.asp
- collared coils for over one-hundred and fifty dipoles are complete, with over eighty-five dipole cold masses delivered, fifty dipoles assembled and over forty dipoles cold tested.
- superconducting cable production is progressing well. The Furakawa (Japan) contract is finishing. The IGC/OKAS contract will be finished in the next few months and Brugg cabling is now ramping up to speed.
- CERN Council approved the creation of a new category of locally recruited staff to fulfill the Organization's needs for technicians and administrative personnel. This is an important step towards securing the human resources crucial for the completion of the LHC.

U.S. LHC Accelerator- As of June 30, 2003, the overall project was 86% percent complete versus the scheduled plan of 91% percent complete. Overall technical progress remains good with all major items in production, including the cryogenic feedboxes. Contingency continues to be reduced to address engineering change requests, and this remains a concern that is being closely monitored and carefully managed by the project. The schedule of deliverables is slightly behind plans, but well in advance of CERN requirements. Project highlights are listed below:

- [Fermilab] The second Q2 quadrupole, consisting of cold masses MQXB03 and MQXB04, was installed on the test stand. The third Q2, consisting of cold masses MQXB05 and MQXB06, is completed. Cold masses 7-10 are complete and ready for assembly into the fourth and fifth Q2 magnets with receipt of correction magnets from CERN.
- [BNL] The second and third D1 dipole magnets arrived at CERN and the fourth D1 has been shipped. All nine D2 magnets have been cryostatted, five have been tested, and three have had cryogenic feed piping assemblies installed. The sixth D2 magnet is under test. All six D3 cold masses, which will be become three magnet assemblies, are complete through shell and end plate welding. The first of the three D4 magnets has been cryostatted. Superconducting cable testing reached 79% of the planned rate this quarter, the highest of any quarter to-date, with 90% for May, the highest of any month-to-date.
- [LBNL] The cryogenic feedbox vendor is progressing well, being on schedule overall and ahead of schedule on small parts. Assembly is complete on TAS beam absorbers and they were sent to a vendor for crating and transport to CERN. One of the TAN beam tube assemblies is complete and has been received at LBNL.

Left- The picture below shows the ATLAS Tile Calorimeter entire pre-assembly complete at CERN. The people standing on the scaffolding provide a sense of scale. The U.S. (led by ANL) produced 64 modules for this assembly, and have assisted with this assembly and alignment effort through technical coordination.
Insert- the last tile calorimeter module being inserted.

Left- Mounting of CMS Cathode Strip Chambers at CERN is a success!

Above- All four completed TAS absorbers leaving LBNL en-route to a vendor who will crate them for shipment to CERN. The four boxes at the front of the truck contain support and positioning hardware required for installation in the LHC.

CERN Direct Purchases - DOE reimburses CERN for their payments to qualified U.S. vendors [Reference U.S.-CERN Agreement and Accelerator Protocol].

Table 5.1, Status of DOE Contracts (in $000)*

Contract Item	Company (U.S. Supplier)	Contract Price	w/ options & escalation
Nb-Ti Alloy Bars; Ni Sheets	Wah Chang	44,300	55,382
Polyamide Insulation Film	Kaneka High Tech Materials	5,425	6,510
Superconducting Cable	Outokumpu-Advanced Superconductor	16,447	20,985
LHC BPMS Button Feedthroughs	Ceramaseal	898	1,003
Cryogenic Temperature Sensor	Lakeshore		
Cryogenic He Mass Flowmeters	(tbd-contract in process)	1,200	1,200
(tbd-contract in process)	(tbd-contract in process)	(tbd)	3,134
Totals		68,270	88,214

TOTAL Cumulative Payments from DOE to CERN: $ 48,619k

6. FINANCIAL/COST STATUS AND PLANS (as of June 30, 2003)

TOTAL PROJECT FUNDING PLAN (then year millions of dollars)†

Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	Total
Machine Funding Profiles (DOE)													
US LHC Accelerator	2.00	6.67	14.00	15.40	24.92	19.16	10.10	8.70	6.13	2.92	0.00	0.00	110
CERN Direct	0.00	0.00	0.00	8.09	8.29	8.08	11.20	13.40	23.20	17.74	0.00	0.00	90
Machine Total	2.00	6.67	14.00	23.49	33.21	27.24	21.30	22.10	29.33	20.66	0.00	0.00	200
Detector Funding Profiles (DOE and NSF)													
US ATLAS	1.70	3.71	10.05	25.63	28.43	26.77	23.16	24.71	8.99	5.49	3.24	1.88	163.75
DOE	1.70	3.71	10.05	9.00	16.49	14.48	10.51	17.42	8.99	5.49	3.24	1.88	102.95
NSF	0.00	0.00	0.00	16.63	11.94	12.29	12.65	7.29	0.00	0.00	0.00	0.00	60.80
US CMS	2.30	4.61	10.95	38.03	24.26	21.25	21.40	22.91	10.48	5.56	4.20	1.30	167.25
DOE	2.30	4.61	10.95	32.51	20.30	17.15	17.19	20.48	10.48	5.56	4.20	1.30	147.03
NSF	0.00	0.00	0.00	5.52	3.96	4.10	4.21	2.43	0.00	0.00	0.00	0.00	20.22
Detectors Total	4.00	8.32	21.00	63.66	52.69	48.02	44.56	47.62	19.47	11.05	7.44	3.18	

TOTAL DOE & NSF FUNDS, COSTS, & COMMITMENTS (cumulative $000)‡

U.S. LHC Construction Project	A = Funds Allocated	B = Estimate Actual Costs	C = Open Comittments	D= B+C Total	A–D =Funds Available
U.S. ATLAS	144,158	108,129	4,060	112,189	31,969
U.S. CMS	145,706	108,131	18,659	126,790	18,916
U.S. LHC Accelerator	100,950	94,234	0	94,234	6,716
CERN Direct Purchases	49,060	48,619	0	48,619	441
Total	370,150	346,539	23,741	370,280	69,594

* Total includes partial payment to Wah Chung in FY03, with remainder to be paid in FY04; Contract with American Superconductor Corporation for HTS wire will be approved and reported on in subsequent Quarters.
† The funding profile for the U.S. LHC Construction Project is extended through FY07, with no change in total funding, to address the impact of the CERN LHC schedule on U.S. project completion. This change was approved by the DOE Director, Office of Science through a U.S. LHC Project baseline change proposal.
‡ Based on financial reports from the U.S. LHC construction projects. NSF funding is provided after the beginning of the fiscal year and therefore it is necessary to carry-over funding into the subsequent fiscal years.

7. DOE/NSF COST BASELINES AT LEVEL 2 (in $000)

U.S. ATLAS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Silicon System	21,370	6	21,376
1.2	Transition Radiation Tracker	11,386	0	11,386
1.3	Liquid Argon Calorimeter	44,169	0	44,169
1.4	Tile Calorimeter	10,763	244	11,007
1.5	Muon Spectrometer	27,012	20	27,032
1.6	Trigger/Data Acquisition System	10,973	0	10,973
1.7	Common Projects	9,179	0	9,179
1.8	Education	286	0	286
1.9	Project Management	8,279	0	8,279
1.10	Technical Coordination	2,150	0	2,150
	Contingency	18,183	- 270	17,913
	U.S. ATLAS Total Project Cost Baseline	163,750	0	163,750

U.S. CMS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Endcap Muon	39,787	0	39,787
1.2	Hadron Calorimeter	42,110	696	42,806
1.3	Trigger and Data Acquisition	14,629	6	14,635
1.4	Electromagnetic Calorimeter	10,746	337	11,083
1.5	Forward Pixels	7,366	6	7,372
1.6	Common Projects	23,349	0	23,349
1.7	Project Office	7,048	0	7,048
1.8	Silicon	3,383	0	3,383
	Contingency	18,832	-1,045	17,787
	U.S. CMS Total Project Cost Baseline	167,250	0	167,250

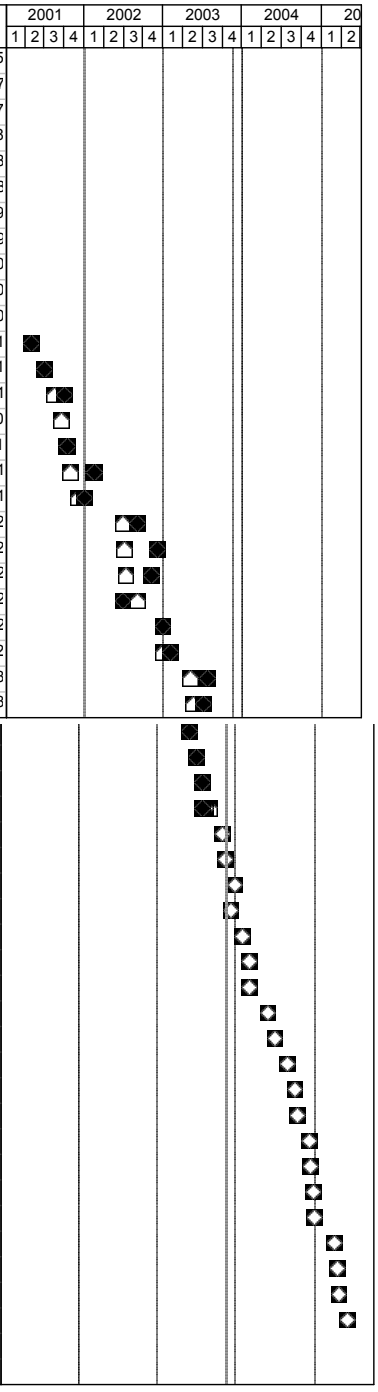
U.S. LHC Accelerator Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Interaction Region Components	59,893	464	60,357
1.2	Radio Frequency Straight Section	16,120	0	16,120
1.3	Superconducting Wire and Cable	13,235	-106	13,129
1.4	Accelerator Physics	3,359	1	3,360
1.5	Project Management	13,271	0	13,271
	Contingency	4,122	-359	3,763
	U.S. LHC Accelerator Total Project Cost Baseline	110,000	0	110,000

8. SCHEDULE STATUS AND PLANS

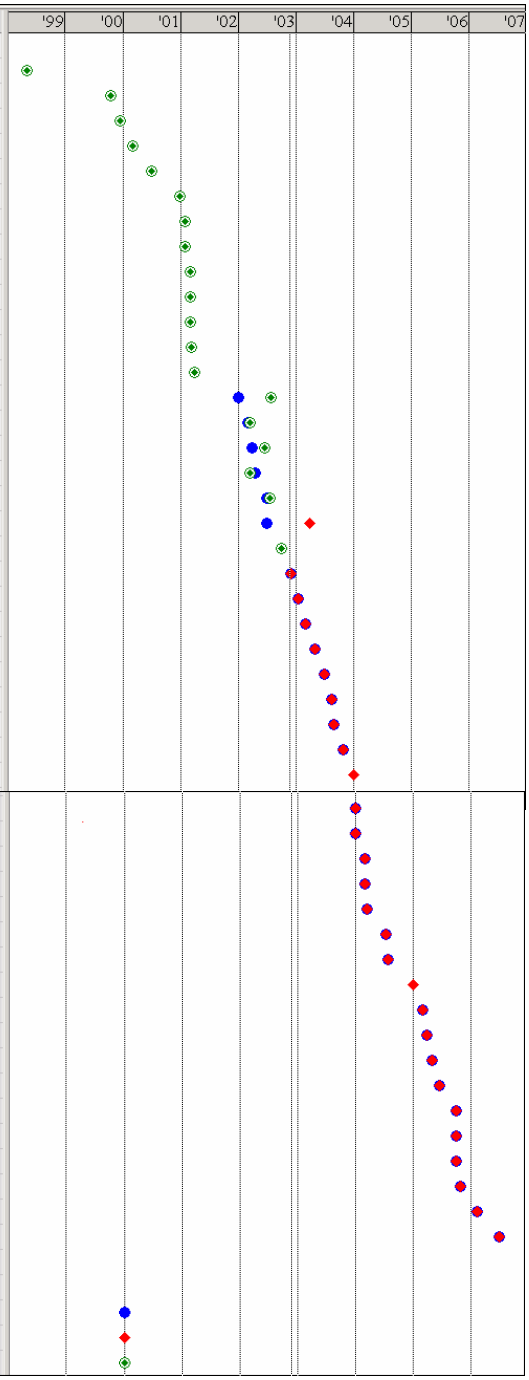
8.1 U.S. ATLAS Construction Project Milestones

ID	Subsystem ID	Milestone	ETC03 Baseline	Forecast	Actual
1		Project Start (10/1/95)	Sun 10/1/95	Sun 10/1/95	Sun 10/1/95
2	Tile L2/1	Start Submodule Procurement	Mon 9/1/97	Mon 9/1/97	Mon 9/1/97
3	Tile L2/2	Technology Choice for F/E Electronics	Sat 11/15/97	Sat 11/15/97	Sat 11/15/97
4	LAr L2/1	Cryostat Contract Award	Fri 7/24/98	Wed 8/5/98	Wed 8/5/98
5	LAr L2/2	Barrel FTs Final Design Review	Wed 9/30/98	Fri 10/2/98	Fri 10/2/98
6	TRT L2/1	Final Design Complete	Thu 12/31/98	Mon 12/7/98	Mon 12/7/98
7	LAr L2/4	FCAL Mech Design Complete	Mon 12/14/98	Wed 12/15/99	Wed 12/15/99
8	Tile L2/3	Start Module Construction	Sat 5/1/99	Mon 9/20/99	Mon 9/20/99
9	TDAQ L2/1	Select Final LVL2 Architecture	Fri 12/31/99	Fri 3/31/00	Fri 3/31/00
10	LAr L2/3	Start Elec.'s Production (Preamps)	Fri 6/30/00	Fri 6/30/00	Fri 6/30/00
11	Muon L2/1	Start MDT Chambers Lines 1 & 3	Mon 7/17/00	Fri 9/15/00	Fri 9/15/00
12	Muon L2/6	Kinematic Mount Design Complete	Tue 1/30/01	Tue 1/30/01	Tue 1/30/01
13	Tile L2/4	Start Production of MBs	Sun 4/1/01	Fri 3/30/01	Fri 3/30/01
14	LAr L2/9	Cryostat Arrives at CERN	Tue 5/15/01	Mon 7/2/01	Mon 7/2/01
15	TRT L2/4	Select Final Elec Design	Fri 6/15/01	Wed 8/30/00	Wed 8/30/00
16	Sil L2/1	Start Full Silicon Strip Elec Production	Fri 7/6/01	Sun 7/15/01	Sun 7/15/01
17	Sil L2/6	Pixels '1st IBM Prototype Submitted'	Thu 7/26/01	Mon 11/12/01	Mon 11/12/01
18	Muon L2/2	Start CSC Chamber Production	Sat 9/1/01	Mon 10/1/01	Mon 10/1/01
19	LAr L2/6	Level 1 Trigger Final Design Complete	Sat 3/30/02	Thu 5/30/02	Fri 5/31/02
20	Muon L2/3	MDT Electronics ASD PRR	Mon 4/1/02	Sun 9/1/02	Fri 8/30/02
21	Sil L2/2	Start Full Strip Module Production	Fri 4/12/02	Mon 8/5/02	Mon 8/5/02
22	LAr L2/10	Barrel FTs Production Complete	Sat 6/1/02	Mon 3/25/02	Mon 3/25/02
23	LAr L2/8	MB System Production Complete	Mon 9/30/02	Mon 9/30/02	Mon 9/30/02
24	Tile L2/6	Module Construction Complete	Mon 9/30/02	Wed 10/30/02	Wed 10/30/02
25	Tile L2/7	All Modules Delivered to CERN	Fri 1/31/03	Fri 4/18/03	Fri 4/18/03
26	TRT L2/5	Start Production of ASICS	Mon 2/17/03	Tue 4/1/03	Tue 4/1/03
27	Tile L2/5	All Elec.'s Components Delivered to ATLAS	Sat 3/1/03	Sat 3/1/03	Sat 3/1/03
28	TDAQ L2/2	LVL2 Trigger Design Complete	Mon 3/31/03	Mon 3/31/03	Mon 3/31/03
29	TDAQ L2/3	LVL2 Trigger Prototype Complete	Wed 4/30/03	Wed 4/30/03	Wed 4/30/03
30	Sil L2/3	ROD Design Complete	Fri 5/30/03	Thu 5/15/03	Wed 4/30/03
31	Muon L2/5	CSC IC Production Complete	Thu 7/31/03	Thu 7/31/03	NA
32	LAr L2/7	ROD Final Design Complete	Fri 8/15/03	Fri 8/15/03	NA
33	Sil L2/7	Pixels 'Start IBM Production'	Thu 9/25/03	Thu 9/25/03	NA
34	Sil L2/8	Pixels 'Start IBM Outer Bare Module Prod'	Fri 9/5/03	Fri 9/5/03	NA
35	Muon L2/10	MDT Elec.'s Mezz Production Complete	Fri 10/31/03	Fri 10/31/03	NA
36	LAr L2/11	FCAL-C Delivered to EC	Mon 12/1/03	Mon 12/1/03	NA
37	Muon L2/4	Final Design of Global Align Devices	Mon 12/1/03	Mon 12/1/03	NA
38	Sil L2/5	ROD Production/Testing Complete	Mon 3/1/04	Mon 3/1/04	NA
39	TRT L2/2	Module Production Complete (CUM 102)	Thu 4/1/04	Thu 4/1/04	NA
40	TDAQ L2/4	Start Production	Tue 6/1/04	Tue 6/1/04	NA
41	Muon L2/7	MDT Chambers (U.S.) Prod Compl (Qty. 240)	Thu 7/1/04	Thu 7/1/04	NA
42	LAr L2/12	FCAL-A Delivered to EC	Thu 7/15/04	Thu 7/15/04	NA
43	TDAQ L2/5	Start Installation & Commissioning	Mon 9/6/04	Mon 9/6/04	NA
44	Sil L2/4	Compl Shipment of Silicon Strip Modules Prod	Tue 9/14/04	Tue 9/14/04	NA
45	Muon L2/8	Kinematic Mounts/Struts Production Complete	Mon 9/27/04	Mon 9/27/04	NA
46	Muon L2/9	CSC ROD Production Complete	Thu 9/30/04	Thu 9/30/04	NA
47	TRT L2/6	Installation Complete	Tue 1/4/05	Tue 1/4/05	NA
48	TRT L2/3	Barrel Construction Complete	Mon 1/17/05	Mon 1/17/05	NA
49	Sil L2/9	Pixels 'Disk System at CERN'	Fri 1/21/05	Fri 1/21/05	NA
50	Muon L2/12	Global Align System Final Delivery	Tue 3/1/05	Tue 3/1/05	NA
51	TDAQ L2/6	Production Complete	Mon 7/31/06	Mon 7/31/06	NA
52	TDAQ L2/7	Installation & Commissioning Complete	Fri 9/29/06	Fri 9/29/06	NA



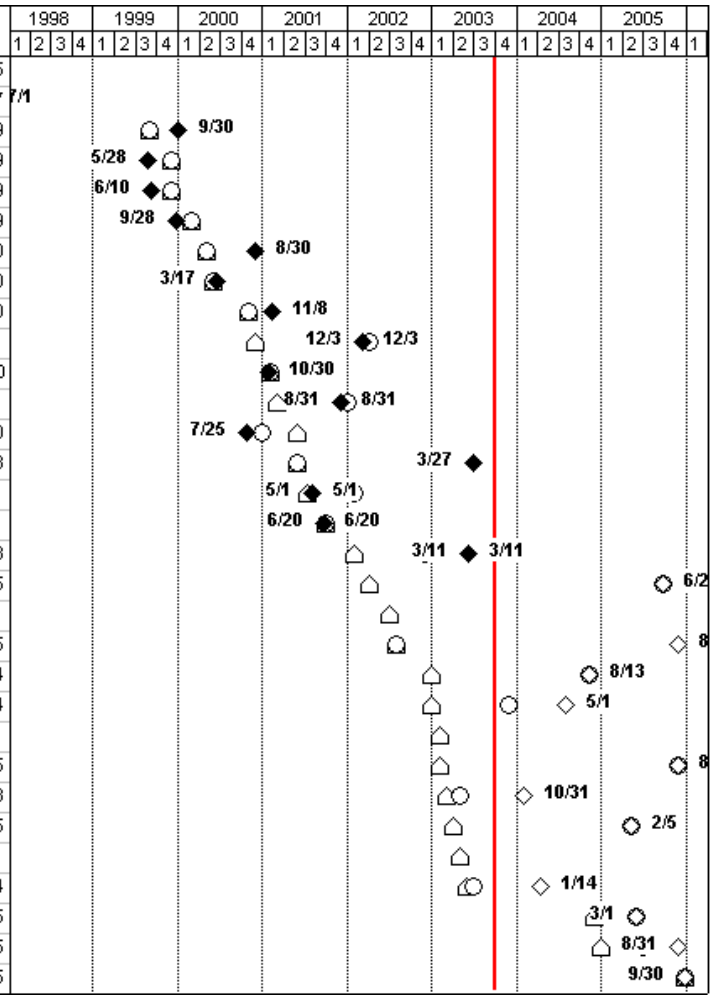
8.2 U.S. CMS Construction Project Milestones

System	Level?	Milestone
		DOE/NSF Proj. Man./FNAL Dep. Dir. Milestones
HCAL	ML3*	HB: Start Optics Production
MUON	ML2*	Begin Assembly of Cathode Strip Chambers at FNAL
HCAL	ML3*	HB-1 Optical Assemblies 100% Complete
HCAL	ML2*	HB-1 Absorber Delivered to CERN
MUON	ML2*	Begin Mass Production of Electronics Boards
HCAL	ML2*	HB+1 Absorber Delivered to CERN
HCAL	ML1*	HB-1 End Module Assembly in SX5
SiTrkr	ML2*	Begin Sensor Module Construction (for M200)
HCAL	ML3*	HF: Start PMT Procurement
HCAL	ML3*	Start HPD Procurement
MUON	ML2*	Begin Mounting Electronics and Testing at UCLA/UF
CP	ML3*	End Assembly of YE+3
HCAL	ML3*	HB+1 Optical Assemblies 100% Complete
HCAL	ML2*	HF: PMT Tests 100% Complete
DAQ	ML1*	Submit DAQ Technical Design Report (TDR)
HCAL	ML3*	QIE ASIC Production Run Complete
HCAL	ML1*	End Assembly of HB+ (Barrel) in SX5
MUON	ML3*	70 ME23/2 CSC's Delivered from UC/UF to CERN
HCAL	ML2*	HCAL Front-End Electronics Production Complete
ECAL	ML-US*	All Lasers (3) Delivered & Installed at CERN
HCAL	ML2*	HCAL HPD Tests 100% Complete
ECAL	ML3*	EB Front-End Electronics Production Launched
SiTrkr	ML2*	25% of Rods Complete
MUON	ML2*	All 148 ME23/2 CSC's Delivered from UC/UF to CERN
SiTrkr	ML3*	50% of Rods Completed
ECAL	ML3*	All APDs Delivered
FPIX	ML2*	Final Full Size ROC Submission (0.25micron)
DAQ	ML2*	Start of Readout and EVB Commissioning
CP	US*	US CMS Common Project Commitment Complete
ECAL	ML-US*	FPPA Delivery Complete
ECAL	ML-US*	Optical Link Delivery Complete
HCAL	ML3*	HCAL "Slice" Test II in SX5 Complete
TRIG	ML3*	CSC: Muon Port Card Production Test Complete
ECAL	ML3*	ECAL Front-End Electronics Production Complete
SiTrkr	ML2*	TOB Complete
CP	ML1*	UX Ready (Start Lowering Magnet Parts)
PO	US*	US CMS Project Office Construction Support Complete
TRIG	ML2*	Finish Trigger Installation
HCAL	ML1*	End Cabling and Test of HB in UX5
DAQ	ML2*	DAQ 0: 25% Performance Installed
FPIX	ML2*	First Butterfly Ready
HCAL	ML1*	End Cabling and Test of HE-1 in UX5
ECAL	ML1*	End Inst., Test, & Debug. of EB (barrel) in UX5
SiTrkr	ML1*	End Installation and Cabling of SiTrkr in UX5
MUON	ML1*	End UX inst/cabling/test of CSC stations on YE-
HCAL	ML1*	HF: Installation and Testing in UX5 Complete
FPIX	ML2*	Pixel Tracker at SX5, Ready for Installation
	Notes	***MLx* Denotes Joint CMS & Agency PM/FNAL Dep Dir Mil***
	-	***Baseline Milestone Symbol (CMS v33 Schedule)***
	-	***Projected Milestone Symbol***
	-	***Achieved Milestone Symbol***



8.3 U.S. LHC Accelerator Construction Project Milestones

Number	ID	Milestone	Revised	Forecast
1-1		Project Start (10/1/95)	Sun 10/1/95	Sun 10/1/95
2-1.1-1	IR	Begin 1st Inner Triplet Quadrupole Model Magnet	Tue 7/1/97	Tue 7/1/97
2-1.3-2	SC	Complete Superconductor Test Facility Upgrades	Tue 6/1/99	Thu 9/30/99
2-1.3-1	SC	All Cable Production Support Equipment Delivered to CERN	Wed 9/1/99	Fri 5/28/99
2-1.2-1	RF	Begin Assembly of 1st Dipole Model Magnet	Wed 9/1/99	Thu 6/10/99
2-1.1-2	IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 1	Wed 12/1/99	Tue 9/28/99
2-1.1-4	IR	Place Purchase Order for HTS Power Leads	Tue 2/1/00	Wed 8/30/00
2-1.1-3	IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 2	Wed 3/1/00	Fri 3/17/00
2-1.2-2	RF	Complete Dipole Model Magnet Program	Tue 8/1/00	Wed 11/8/00
2-1.2-3	RF	Begin RF Region Dipole Production Assembly	Tue 1/1/02	Mon 12/3/01
2-1.1-5	IR	Begin Absorber Fabrication	Wed 11/1/00	Mon 10/30/00
2-1.1-6	IR	Complete Inner Triplet Quadrupole Prototype Magnet Program	Mon 10/1/01	Fri 8/31/01
2-1.1-7	IR	Begin Interaction Region Beam Separation Dipole Prod. Assembly	Sun 10/1/00	Tue 7/25/00
2-1.1-8	IR	Begin Inner Triplet Feedbox Fabrication	Thu 3/1/01	Thu 3/27/03
2-1.1-9	IR	Begin Inner Triplet Quadrupole Production Assembly	Thu 11/1/01	Tue 5/1/01
1-2		Decision on RF Region Quadrupoles	Sun 7/1/01	Wed 6/20/01
2-1.1-10	IR	Complete 1st Inner Triplet Quadrupole Magnet	Sun 9/1/02	Tue 3/11/03
2-1.2-4	RF	Delivery of D3, D4 for IR4 right	Fri 6/24/05	Fri 6/24/05
2-1.1-11	IR	Delivery of D2 for IR8 Left **DELETED**		
2-1.1-12	IR	Complete Inner Triplet Feedbox Fabrication	Wed 5/1/02	Wed 8/31/05
2-1.1-13	IR	Delivery of All Inner Triplet System Components for IR8 Left (MQX,DFBX,D1,D	Fri 8/13/04	Fri 8/13/04
2-1.2-5	RF	Complete RF Region Dipole Production Assembly	Mon 9/1/03	Sat 5/1/04
2-1.1-14	IR	Delivery of D2 for IR5 Left **DELETED**		
2-1.2-6	RF	Delivery of D3, D4 for IR4 left	Wed 8/31/05	Wed 8/31/05
2-1.1-15	IR	Complete Absorber Fabrication	Sat 2/1/03	Fri 10/31/03
2-1.1-16	IR	Delivery of All Inner Triplet System Components for IR8 Right (MQX,DFBX,D1,[	Sat 2/5/05	Sat 2/5/05
2-1.1-17	IR	Delivery of D2 for IR8 Right**DELETED**		
2-1.1-18	IR	Complete Interaction Region Dipole Production Assembly	Tue 4/1/03	Wed 1/14/04
2-1.1-30	IR	Complete Inner Triplet Quadrupole Production	Tue 3/1/05	Tue 3/1/05
2-1.3-3	SC	Series Wire and Cable Testing Complete	Thu 3/31/05	Wed 8/31/05
1-3		Project Completion (9/30/05)	Fri 9/30/05	Fri 9/30/05



Original Baseline
Revised Baseline
Forecast
Actual
External Milestone
External Milestone
External Milestone
Deadline

9. TECHNICAL BASELINE STATUS

U.S. ATLAS Construction Project - No change. The U.S. ATLAS collaboration defined a list of initial deliverables representing the U.S. contribution to ATLAS. This list was originally approved by the JOG in March 1998. Deliverables are listed in an Appendix to the U.S. ATLAS Construction Project Management Plan. The JOG approved a revision to the U.S. ATLAS Construction Project Management Plan in February 2003, incorporating changes to implement a two-phased project completion matched to CERN plans.

U.S. CMS Construction Project - No change. The U.S. CMS collaboration defined a list of deliverables representing the U.S. contribution to CMS. This list was originally approved by the JOG in October 1998 and is referenced in the U.S. CMS Project Management Plan. The JOG approved a revision to the U.S. CMS Construction Project Management Plan in February 2003, incorporating changes to implement a two-phased project completion matched to CERN plans.

U.S. LHC Accelerator Construction Project - No change. U.S. LHC Accelerator Project - The U.S. deliverables to CERN are defined in the Implementing Arrangement (IA) to the Accelerator Protocol. The IA is an annex to the U.S. LHC Accelerator Project Management Plan. The IA was signed by the CERN and U.S. signatories in July 1998 and revised in May 2002 to update delivery dates to match CERN schedule and address a CERN-directed change on RF region lattice design impacting U.S. work.

CERN Direct Purchases - No change. CERN will procure from U.S. industrial firms supplies required to construct the LHC accelerator. These supplies will include superconducting alloy, cable, insulation, and other materials.

10. BASELINE CHANGE ACTIVITY

Baseline Control Level	Baseline Changes
Level 1, DOE/NSF Joint Oversight Group	No changes this quarter
Level 2, DOE/NSF Project Office	
U.S. ATLAS	Changes to the Level 2 cost, scope and schedule baseline.
U.S. CMS	Changes to the Level 2 cost, scope and schedule baseline.
U.S. LHC Accelerator	Changes to the Level 2 cost, scope and schedule baseline.

APPENDIX A - FUNDING BY INSTITUTION (in thousands of dollars), U.S. CMS

U.S. CMS Construction Project

	FY 1998				FY 1999				FY 2000				FY 2001				FY 2002				
Institution	DOE Grant	DOE Contract	NSF	Total	DOE Grant	DOE Contract	NSF	Total	DOE Grant	DOE Contract	NSF	Total	DOE Grant	DOE Contract	NSF	Total	DOE Grant	DOE Contract	NSF	Total	Grand Total
FNAL	0	5,517	0	5,517	0	10,817	40	10,857	0	5,981	0	5,981	0	6,033	0	6,033		6,318	14	6,332	34,720
Fairfield	0	29	0	29	0	0	0	0	0	10	0	10	0	13	0	13		8		8	60
Maryland	90	65	0	155	0	132	131	263	0	250	0	250	0	189	0	189		1,361		1,361	2,218
Boston U.	0	32	0	32	31	111	0	142	0	132	0	132	0	88	0	88		222	1,130	1,352	1,746
Florida State	60	54	0	114	71	118	0	189	80	54	0	134	68	43	0	111	50	16		66	614
U. of Minnesota	60	95	0	155	161	452	0	613	141	202	0	343	153	401	0	554	85	305		390	2,055
U. of Iowa	77	62	0	139	20	5	0	25	0	453	0	453	0	843	0	843		48		48	1,508
U. of Rochester	127	1,159	0	1,286	262	485	0	747	441	253	0	694	464	143	0	607	358	162		520	3,854
Notre Dame	0	52	0	52	0	44	184	228	0	14	193	207	0	14	112	126		17	209	226	839
Purdue	38	135	0	173	49	166	0	215	0	175	0	175	0	89	0	89		377		377	1,029
U. of Miss.	46	100	0	146	68	91	0	159	69	108	0	236	0	235	0	235	34	109		143	919
U. of Florida	44	95	0	139	184	412	0	596	332	853	0	1,185	432	293	0	725	171	310		481	3,126
Ohio State U.	140	64	0	204	275	212	0	487	196	732	0	928	151	700	0	851	180	916		1,096	3,566
Carnegie Mellon	0	113	0	113	0	291	0	291	0	312	0	312	0	258	0	258		301		301	1,275
Rice	138	19	0	157	102	56	0	158	132	16	0	148	196	36	0	232	134	61		195	890
U. of Wisconsin	533	1,052	0	1,585	471	3,598	0	4,069	722	2,995	0	3,717	504	4,489	0	4,993	193	1,620	63	1,876	16,240
U.C. Davis	34	100	0	134	0	78	0	78	0	502	0	502	0	63	0	63		200		200	977
UCLA	150	87	0	237	249	173	0	422	244	391	0	635	347	546	42	935	284	496	43	823	3,052
U.C. Riverside	20	10	0	30	0	164	0	164	0	70	0	70	0	72	0	72		74		74	410
John Hopkins	0	29	0	29	0	0	70	70	0	0	40	40	0	0	5	5			7	7	151
Northwestern	0	59	0	59	5	26	0	31	0	114	0	114	0	39	0	39		33		33	276
Rutgers	0	13	0	13	0	0	34	34	0	2	140	142	0	0	101	101			127	127	417
Princeton	0	256	0	256	0	626	0	626	0	667	0	667	0	133	0	133		11		11	1,693
Caltech	0	148	0	148	0	458	0	458	0	367	0	367	0	452	0	452		116		116	1,541
U.C. San Diego	11	0	0	11	11	90	24	125	36	0	0	36	0	43	0	43		57		57	272
Northeastern	0	0	0	0	0	0	3,370	3,370	0	0	1,741	1,741	0	0	1,482	1,482			3,073	3,073	9,666
U. Ill.-Chicago	0	0	0	0	0	0	124	124	0	0	309	309	0	0	262	262			172	172	867
U. of Nebraska	0	0	0	0	0	0	24	24	0	0	2	2	0	0	100	100			7	7	133
MIT	0	37	0	37	15	67	0	82	0	78	0	78	0	87	0	87		58		58	342
Iowa State	0	0	0	0	0	0	19	19	0	356	0	356	0	29	0	29		177		177	581
Kansas State													0	66	0	66		28		28	94
LBL													0	554	0	554		543		543	1,097
Texas Tech													0	876	0	876		275		275	1,151
UC Santa Barbara													0	13	0	13		461		461	474
U. of Kansas													0	0	6	6			210	210	216
Florida Inst. Tech.																		60		60	60
Subtotal	1,568	9,382	0	10,950	1,974	18,672	4,020	24,666	2,393	15,087	2,425	19,964	2,315	16,840	2,110	21,265	1,489	14,740	5,055	21,284	98,129

As of 12/3/02

APPENDIX B - FUNDING BY INSTITUTION (in thousands of dollars), U.S. ATLAS

U.S. ATLAS Construction Project

	FY 1998				FY 1999				FY 2000				FY 2001				FY 2002				
Institution	DOE Grant	Contract	NSF	Total	DOE Grant	Contract	NSF	Total	DOE Grant	Contract	NSF	Total	DOE Grant	Contract	NSF	Total	DOE Grant	Contract	NSF	Total	Grand Total
ANL	-	1,098	-	1,098	-	967	-	967	-	922	-	922	-	572	-	572		771		771	4,330
BNL	-	3,903	-	3,903	-	2,581	-	2,581	-	6,429	-	6,429	-	7,213	-	7,213	392	5,104		5,495	25,621
LBNL	-	633	-	633	-	715	-	715	-	420	-	420	-	1,775	-	1,775		2,049		2,049	5,592
SUNY/Albany	20	-	-	20	48	-	-	48	50	-	-	50	-	-	-	-				-	118
U. of Arizona	320	100	-	420	634	-	-	634	557	-	-	557	298	153	-	451		378		378	2,440
Boston U.	224	-	-	224	298	-	-	298	287	-	-	287	155	336	-	491		295	277	572	1,872
Brandeis U.	265	45	-	310	-	-	593	593	-	-	478	478	-	-	731	731			406	406	2,518
U.C.Irvine	193	-	-	193	-	-	93	93	-	-	-	-	-	-	266	266				-	552
U.C. Santa Cruz	404	-	-	404	63	-	-	63	-	-	568	568	-	-	2,702	2,702			442	442	4,179 *
U. of Chicago	-	54	-	54	-	-	1,069	1,069	-	-	264	264	-	-	723	723			159	159	2,269
Duke U.	190	-	-	190	601	-	-	601	417	-	-	417	501	158	-	659			375	375	2,242
Hampton U.	-	-	-	-	-	-	538	538	-	-	293	293	-	-	590	590			204	204	1,625
Harvard	234	-	-	234	-	-	654	654	-	-	390	390	-	-	3,882	3,882			953	953	6,113 *
U. of Illinois	50	159	-	209	347	-	-	347	294	-	-	294	76	-	-	76	99			99	1,025
Indiana U.	190	-	-	190	765	-	-	765	460	-	-	460	-	713	-	713		361		361	2,489
MIT	50	-	-	50	105	-	-	105	334	-	-	334	190	237	-	427	389			389	1,305
Michigan State	-	35	-	35	-	-	178	178	-	-	293	293	-	-	316	316				-	822
Nevis/Columbia	-	675	-	675	-	-	2,680	2,680	-	-	1,422	1,422	-	-	4,483	4,483			3,632	3,532	12,791
U. of New Mex.	20	-	-	20	30	-	-	30	24	-	-	24	-	127	-	127		57		57	258
Northern Illinois	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				-	-
Ohio State U.	-	-	-	-	100	-	-	100	45	-	-	45	-	-	-	-	157			157	302
U. of Michigan	62	254	-	316	716	-	-	716	518	-	-	518	681	-	-	681	230		487	717	2,948
U. of Oklahoma	30	-	-	30	-	-	41	41	-	-	51	51	-	-	49	49			202	202	373 *
U. of Penn.	250	-	-	250	300	-	-	300	265	-	-	265	679	-	-	679			850	850	2,344
U. of Pittsburg	110	-	-	110	-	-	150	150	-	-	210	210	-	50	201	251			630	630	1,351
U. of Rochester	-	-	-	-	-	-	3,587	3,587	-	-	1,664	1,664	-	-	1,477	1,477				-	6,728
U.T. Arlington	50	82	-	132	-	-	474	474	-	-	230	230	-	-	584	584				-	1,420
S. Methodist	40	-	-	40	124	-	-	124	30	-	-	30	87	184	-	271	98			98	563
SUNY/Stony B.	27	-	-	27	-	-	1,045	1,045	-	-	1,037	1,037	-	-	426	426			89	89	2,624
Tufts University	50	-	-	50	20	-	-	20	20	-	-	20	-	-	-	-	11			11	101
U. Washington	-	-	-	-	-	-	240	240	-	-	318	318	-	-	1,377	1,377			737	737	2,672
U. of Wisconsin	230	-	-	230	429	-	-	429	665	-	-	665	1,112	-	-	1,112	377			377	2,813
Subtotal	3,009	7,038	-	10,047	4,580	4,263	11,342	20,185	3,966	7,771	7,218	18,955	3,779	11,518	17,807	33,104	1,752	9,014	9,343	20,108	102,399
Reserve	-	3	-	3	157	-	5,289	5,446	327	1,936	1,795	4,058	-	300	-			118		118	9,625
									-	2,602	2,928	5,530	-	-	-					-	5,530 *
Total	3,009	7,041	-	10,050	4,737	4,263	16,631	25,631	4,293	12,309	11,941	28,543	3,779	11,818	17,807	33,104	1,752	9,132	9,343	20,226	117,554